yeast, and on the phenomena of fermentation, by A. Certes and D. Cochin.—On the presence of duodenal anchylostoma in some Belgian hospitals, by Ch. Fisket.—On the presence of a coxal gland in *Galeodes araneoïdes*, by J. MacLeod.—Note on G. Edon's work on the Carmen Arvale, by Alph. Le Roy.—Some details on Wissant and its identification with the Portus Iccius of the Romans, by Alph. Wauter.—On the apparent enlargement of the orbs of the sun and moon, by Paul Stroobant.—On a new *Balenoptera rostrata* in the Mediterranean, by J. Van Beneden.—Discourse on geological chronology, by Ed. Dupont. —On the chief cause of cyclones and tropical calms, by M. Folie.

Bulletin de l'Académie des Sciences de St. Pétersbourg, tome xxix. No. 4.—On the applications of the interpolation method proposed by M. W. Tchebychef, by O. Backlund (in German). The fine method of the Russian mathematician is shown to be easily represented in a simple scheme, appropriate to calculations, and the author applies it to three examples, one of which is the calculation of Hasselberg's spectral observations. He shows that, with regard to the easiness and simplicity of calculations, the Tchebychef method leaves nothing to desire, while its results are as reliable as those obtained by the much more tedious method of least squares. Two other examples, one for the declinations as taken from the Cape Catalogue, and compared with those measured at Pulkova, and another for interpolating Pulkova double-star observations, give the same satisfactory results. As known, Tchebychef's method permits also to proceed without making any previous hypothesis as to the degree of the interpolation formula. On the whole, when a considerable number of data is given, and the least squares' method becomes especially tedious, Tchebycheff's method gives excellent results.—The elements and the ephemerides of the Encke comet for its appearance in 1884-85, by O. Backlund. The ephemerides are given from November 7, 1884, to May 6, 1885.—Demonstration of several theorems relative to the numerical function $E(x)$, by V. Bouniakovsky (in French).—Contributions to the Ornis of the Ternate Island, by Th. Pleske (in German). The birds brought from the above island by Dr. Fischer are determined with the help of Salvadori's "Ornithologia della Papuasia," &c. There are eighty-five species described. —Remarks on the *Elapomorphus* genus of Calamaride serpents, by A. Strauch (in German) Having received an herpetologic collection from Brazil, from Dr. Ihering, Prof. Strauch found in it a new species of *Elapomorphus*, which he describes under the name of *E. Iheringii*, and he accompanies the description by a thorough critical revision of all known species of the same genus. The paper is thus a systematic monograph of the genus, which contains now eighteen species.

THE *Belgique horticole* for July to September, 1884, contains a retranslation of Prof. Jacobsthal's essay on "The Evolution of Vegetable Forms in Decorative Art," and M. Guirand's on the gardens of the Mediterranean coast, which have already appeared in our columns. We have also other articles of interest taken from other journals, and the usual descriptions and admirable coloured plates of new plants.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, February 12.—"Note on the Condensation of Gases at the Surface of Glass." (Preliminary.) By J. T. Bottomley, M.A , F.R.S.E. Communicated by Prof. Sir William Thomson, F.R.S.

It is well known to those who have endeavoured to obtain, in glass vessels, the very perfect vacuums first sought after and obtained by Crookes, and producible by the mercurial pumps, that the operation is much assisted by heating the glass vessels to be exhausted, and even the tubes of the pump, to a high temperature. The difficulty of removing the film of air and moisture adhering to glass tubes is also well known to makers of barometers and thermometers.

When the Sprengel pump is used for producing a vacuum, and when a tolerably good vacuum has been produced, so that the barometric gauge indicates a presence of one millimetre or half a millimetre of mercury, the drops of mercury falling in the tube of the Sprengel give rise to a loud metallic hammering sound; and they fall with such unbroken sharpness that those who use this form of pump are often troubled by the "fall-tubes" splitting longitudinally through a length of several inches —a phenomenon in itself very remarkable, considering the strength of the tubes and the smallness of the mercurial drops. If, while this hammering is going on, the glass vessel which is being exhausted and the leading tubes of the Sprengel pump be heated by passing the flame of a spirit-lamp or of a Bunsen burner over them, the hammering immediately ceases, and on looking closely at the fall-tubes it is seen that they are carrying down air which the heat has liberated from the glass walls of the apparatus. The ordinary barometer-gauge is scarcely sensitive enough to show an increase of pressure, but the McLeod gauge readily shows it.

There is another well-known phenomenon connected with the condensation of gases and vapours on the surface of glass: viz. the condensation of a watery film over the glass of electric apparatus, in virtue of which, at temperatures considerably above the dew point, the glass supports are not insulators of electricity. This film of moisture is removed by exposing the glass stems to heat, or to an artificially dried atmosphere. Some years ago, at the wish of Sir William Thomson, I endeavoured to weigh this film of moisture, but was absolutely unsuccessful. The film must be of extreme tenuity. Prof. Quincke has, however, made important researches on the "distance of capillary action" and on some of the properties of these very thin films. His results are given in two papers: *Poggendorff's Annalen*, 108, p. 326, 1859; and *Wiedemann's Annalen*, vol. ii. 1877, p. 145. He finds their thickness to be comparable with 5×10^{-5} cm.

With the view of measuring the quantity of gas condensed upon a given surface of glass, I caused to be prepared in August last a large quantity of fine glass thread. Some of this was of flint glass rod or cane, which was softened in the blowpipe flame, and drawn out on to a wheel. The remainder was of flint glass tubes, drawn out in a similar way. The spun glass was carefully parcelled up in paper and put aside till I should be ready to use it.

On January 3 I put a quantity of the non-tubular glass fibre into a glass tube 2 cm. in diameter and 12 cm. long, and attached it by a glass sealing to a five-fall Gimingham Sprengel pump. The pump, which was in excellent order, was then worked rapidly till I had produced a very good vacuum, which by the McLeod gauge gave me an indication of 0·3 **M** pressure.[1] The pump was then left for about an hour, and at the end of that time, passing one more bottle full of mercury through the pump, I ascertained that the vacuum had not sensibly deteriorated, the McLeod gauge giving identically the same reading as before. This exhaustion was performed without the application of any unusual heat to the tube containing the glass fibres. The temperature of the room was about 56° F.

I now raised the mercury to the upper level and allowed it to flow through the pump, and the drops fell with the well-known loud hammering noise. While this was going on I applied a Bunsen burner to the tube containing the spun glass. In a few seconds the hammering of the mercury ceased, and on applying the test of the McLeod gauge the pressure within the pump was found to have risen largely. I did not, however, obtain a measurement with the gauge corresponding to the maximum pressure of the gas driven off, or to any particular state.

I now proceeded to pump out all the gas I could, working the pump and heating the tube containing the glass fibres strongly. The heating was carried on from time to time till the tube, which was of German glass, showed signs of softening and of falling in; and the glass fibres were likewise, some of them, slightly softened and bent.

The pump was worked for over an hour, the heating being applied, and the gas, which was easily seen being carried down, was collected in a tube made for the purpose, which was fitted on over the upturned ends of the five fall-tubes. At the end of this time the vacuum was again fairly good, though not so good as it was before the heating commenced. The McLeod gauge indicated 1·2 **M**. It was seen that very little more air was being carried down, and I did not wish to push the vacuum farther than, or quite so far as, the vacuum which had been obtained before the liberation by heat of the condensed gas.

The collecting tube was now removed, and the gas obtained was measured and analysed, so far as it was possible to analyse a quantity so small.

The total amount of gas collected was calculated to be, at 15° C. and a pressure of 760 mm., 0·45 of a cubic centimetre. To this a small quantity of strong solution of caustic potash was added, and time was given for absorption. A small quantity of pyrogallic acid was next added, and the further absorption observed. The residue was so small that I could do nothing farther.

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[1] **M** standing for one-millionth of an atmo.

The result of the analysis showed 8·24 per cent. of the whole to be carbonic acid gas (absorbable by caustic potash). Of what remained 24·8 per cent. was oxygen (absorbable by pyrogallic acid and caustic potash mixed). The residue, 75·2 per cent., was, I presume, mainly, if not wholly, nitrogen. I ought to remark that my pump was furnished, as is usual, with the phosphoric acid drying tube. The gas, therefore, which I collected was perfectly dry, and I have no way at present of ascertaining how much moisture adheres to the spun glass. In stating the results of the analysis I have made no correction for moisture introduced with the potash solution.

In order to make an estimate of the amount of surface exposed by the spun glass, I measured, with a screw micrometer gauge, the diameters of 200 of the fine glass fibres taken at random. I found them, as I expected from the care with which they had been prepared, fairly uniform, and the average diameter was 7·06 hundredths of a millimetre. Weighing also the 200, and then the whole quantity, I found the whole number of the fibres to be 6370. The average length was 10·25 cm. The surface was thus 1448 sq. cm., or equal to that of a square 38 cm. in the edge.

I am preparing for further experiments on this subject, and hope soon to be able to add to it observations on the amount and on the electric conductivity of the film of moisture condensed upon the surface of glass.

Additional Note.—Since the writing of my former communication on this subject, I have made some further experiments on it, and I beg leave to give an account of the results of one of these experiments.

Having filled a fresh tube with fresh spun glass, I carefully exhausted with the Sprengel pump on January 24, and the exhaustion was kept up till February 5—that is, for twelve days. During this time I frequently tested with the McLeod gauge. A very slight increase of pressure was found during that interval, but it was so slight that I am not able to say that it was greater than that which is observed at all times, even with the Sprengel pump in excellent order, when a vacuum is maintained for several days.

On February 5 I passed three or four bottlesful of mercury through the pump, and had a vacuum of about 0·5 M, as shown by the McLeod gauge. I then applied heat, and had instantly an abundance of gas given off from the spun glass. This was collected as before, and analysed.

The number of glass fibres was 15,500, giving an estimated surface area of 3527 sq. centims. The amount of gas given off was 0·41 c.c., which is considerably less in proportion than in my first experiment.

Of this gas it was found that 78·6 per cent. was carbonic acid gas (absorbable by caustic potash). Of the remainder 10·5 per cent. was oxygen (absorbed by pyrogallic acid and potash), while 89·5 per cent. was left unabsorbed, and may be supposed to be mainly nitrogen.

The very large proportion of carbonic acid gas is remarkable, and it is difficult to account for, unless we may suppose that it was taken up by the glass in large quantity during the operations of drawing out the glass into fibres and inclosing it in the containing tube—operations during which there was, in these preliminary experiments, an abundant supply from the blowpipe flames.

Chemical Society, February 5.—Dr. W. H. Perkin, F.R.S., President, in the chair.—A lecture was delivered "On Chemical Changes in their relation to Micro-Organisms," by Professor Frankland, F.R.S., a plant being defined as an organism performing synthetical functions, or one in which these functions are greatly predominant; an animal, as an organism performing analytical functions, or one in which these functions greatly predominate. The micro-organisms were classed by the lecturer among animals. Their life essentially depends upon the taking asunder of more or less complex compounds, resolving them into simpler compounds at the expense of potential energy. As micro-organisms are commonly termed "ferments," and their analytical operations "fermentations," it is necessary to sharply distinguish between organised ferments and certain bodies which bring about analogous chemical changes, but which are not only not organised, but exist in solution. These latter, or "soluble ferments," as they are commonly termed, are said to act by contact: they produce certain chemical changes in the fermentescible substances without themselves furnishing from their own substance any of the products of change; the effects they produce are essentially analytical, consisting in the assimilation of water and the splitting up of the fermentescible substance into two or more new molecules, and may be brought about by purely chemical means. They differ only, or chiefly, from the organised ferments in that they are unorganised and do not increase in amount during their action upon fermentescible substances, of which a very large, although limited, quantity may undergo transformation by the action of a very minute quantity of the ferment. A list of changes brought about by unorganised ferments was given. In that portion of the animal kingdom with which we are best acquainted, oxidation is the essential condition of life: it is the kind of action by which the animal changes actual into potential energy. The changes effected by micro-organisms are essentially of the same character as those brought about by the higher orders of animals: that is to say, they are all changes by which potential becomes actual energy. With one or two exceptions, the chemical changes effected by micro-organisms—unlike those produced by soluble ferments—cannot be brought about by other means. The observations of Hatton and others have shown that micro-organisms retain their vitality in presence of a variety of substances which rapidly prove fatal to higher animals; the unexpected fatal effects of spongy iron would seem to promise, however, that there are substances fatal to bacterial life which have no toxic effect on more highly organised animals. It has not yet been shown that any degree of cold, however intense, is fatal; animation may be suspended, but it is restored when the temperature rises. With regard to heat, the lowest fatal temperature recorded is 40° C., but many species can withstand much higher temperatures. Chloroform and compressed air are said to arrest their action, but have no influence in preventing the changes brought about by unorganised ferments. The position of micro-organisms in nature is only just beginning to be appreciated; their study both from chemical and biological points of view is, however, of the highest importance to the welfare of mankind, and leads the inquirer right into those functions of life which are still shrouded in obscurity. In the course of the lecture the best known micro-organisms and the chemical reactions due to them were passed in brief review. Prof. Frankland also referred to the following results of an experiment made in the month of June, in which fresh urine was allowed to stand for 25 days in a clean glass vessel:—

	Residue left on evaporation and drying at 100° C.	Organic carbon.	Nitrogen as urea and other organic matter.	Ammonia.	Microscopical observations.
Fresh urine	4817·0	943·81	1080·27	142·40	No bacilli.
,, after 1 day...	—	940·46	1095·05	136·65	,,
,, ,, 3 days..	—	928·76	1106·70	136·50	,,
,, ,, 5 ,,	—	882·66	983·26	288·55	Sparse bacilli.
,, ,, 7 ,,	—	739·82	900·80	338·60	
,, ,, 9 ,,	—	682·99	784·93	485·12	Numerous bacilli.
,, ,, 11 ,,	—	621·02	744·64	534·80	Very numerous bacilli.
,, ,, 14 ,,	—	559·22	481·49	870·62	Vast numbers of bacilli.
,, ,, 16 ,,	—	530·68	492·04	881·87	Mostly still.
,, ,, 18 ,,	—	487·01	355·25	990·78	,, ,,
,, ,, 21 ,,	—	466·43	278·22	1105·75	All dead or still.
,, ,, 23 ,,	—	451·43	347·45	1017·25	,, ,,
,, ,, 25 ,,	2718·0	460·78	283·90	1070·50	
After allowing for evaporation	2045·5	346·77	213·66	805·63	

The results of these observations and determinations which were made during the month of June show conclusively that, previously to the development of *Bacillus ureæ*, the chemical composition of the urine remained practically unchanged; but with the appearance of micro-organisms, a diminution of organic carbon and a transference of nitrogen from the organic to the ammonia column immediately began. As regards rapidity, this change marched *pari passu* with the density of population, and reached its maximum about the 12th day; for during the three days (11th to 14th) nearly 10 per cent. of carbon disappeared, whilst more than 85 per cent. of the organic nitrogen became ammonia. After the 14th day the rate of change became much slower, on the 18th day the bacilli were mostly either dead or motionless, whilst on and after the 23rd day no more moving bacilli was seen. Altogether the quantity of carbon converted into carbonic anhydride, after allowing for concentration of the liquid by evaporation, amounted to 597·04 parts per 100,000 of liquid, or 63·3 per cent. of the total quantity; whilst the quantity of organic nitrogen converted into ammonia was 546·19 parts per 100,000, or 50·6 per cent. of the whole. These proportions show that all the organic nitrogen contained in the urea was not converted into ammonia. It no doubt escaped as free nitrogen, in accordance with Frank Hatton's observation. In the original urine the proportion of organic carbon to organic nitrogen was as 1 : 1·15, whilst, after the action of the bacilli, it was 1 : 0·62. Prof. Burdon Sanderson said that the main difficulty met with in studying the effects of micro-organisms arose from the fact that it was always difficult and often impossible to distinguish between different organisms. Chemists might naturally turn to biologists for aid in the matter, but biologists must admit the existence of this difficulty. We are fully acquainted with the life history of only one pathogenic organism—*Anthrax bacillus*; of this, thanks to Koch, we know, however, a great deal. The method followed by biologists in studying pathogenic forms was, in the first instance, to prepare a pure cultivation of the organism, and then to obtain the proof that the organism produces its proper effect when transferred to a living animal. The morphological relations of bacteria with plants could not be questioned, but he thought it was really of little consequence for practical purposes whether ferment organisms were regarded as animals or plants; what we want to know is, what are the conditions under which an organism is produced, and its life history. He was in the habit of calling them microphytes, as being a neutral term.—Prof. Ray Lankester was astonished at the definite way in which Prof. Frankland had classed the ferment organisms with animals. Naturalists were led to regard them as plants from examining their relations to other organisms. He agreed with Prof. Sanderson that "microphyte" was a good name for them, although not precisely for the same reason, but because it really meant a little plant. He stated that it was held hitherto that a micrococcus induced the ammonic change in urine, and not a bacillus as figured by the lecturer. For the purpose of chemical investigation, it was essential to have a pure cultivation. It was curious that the nitrifying organism had not been isolated; its presence had only been inferred, and it had never been satisfactorily separated and identified, although inconclusive statements and observations purporting to inform us as to the form of that organism had been published.—Dr. Brunton said that it was highly probable that the symptoms occurring in certain diseases were due to poisons formed by the action of organisms and not directly to the organisms themselves. This was not improbably the case in cholera. Micro-organisms may even produce substances fatal to themselves, *e.g.*, phenyl compounds. This is also the case with higher organisms, the retention of the urine in man being often attended with fatal results. Although cholera was very probably due to the presence of low organisms, the symptoms were so very like those produced by certain poisons, that it was very difficult to diagnose cases of poisoning by arsenic from cholera cases. The cholera poison was probably of an alkaloïdal character and related to the ptomaïnes. Pepsin converted albuminoïds into peptones, but it was important to note that Brieger had observed that sometimes an alkaloïd having an action similar to curare was formed during peptic digestion, and an alkaloïd having a similar action had been obtained from human urine. These facts rendered it probable that alkaloïds might be formed in the intestinal canal and absorbed into the general circulation. Prof. M. Foster said that the question whether the micro-organisms in question were plants or animals was to him a matter of indifference compared to the question—what was the exact nature of the action by which the organism effected the chemical change? He desired to point out that in certain cases, as in the ammonic conversion of urea, the same change, in this case the conversion of urea into ammonium carbonate, was effected, on the one hand, by a micro-organism, a micrococcus or bacillus, and on the other hand by an unorganised ferment. His friend Mr. Sheridan Lea informed him that he had evidence of both these causes of ammonic conversion of urea. Now, was the action in both cases the same? The idea had naturally occurred that the organism produced its effect by producing an organised ferment. But all attempts to prove the production of such a secretion, so to speak, of a ferment had failed. If such a ferment were produced, it was destroyed or disappeared during its action, whereas ordinary unorganised ferments such as pepsin, &c., were not destroyed at all during their activity, or were destroyed very slowly. On the whole, the probability was that the micro-organism and the unorganised ferment produced the same result in different ways; ought not the *difference* to offer the key for solving the problem? He further desired to remind the Fellows that actions similar to those of these micro-organisms were continually being carried on by the constituent elements of man and other macro-organisms, and would wish, in illustration, to call their attention to the act of secretion by a secreting cell, such as the pancreatic cell. We had evidence that certain constituents of pancreatic juice existed in the cell, not in the form in which they appear in the juice itself, but in an anterior, more complex condition. Thus trypsin occurs in the pancreatic cell not as trypsin but as trypsinogen. Now this trypsinogen, and also probably other "mothers" of the constituent of the juice, exist in the protoplasm of the cell as *discrete granules, lodged in the meshes of the protoplasm, separated from the protoplasm by films of fluid.* Yet the protoplasm, stirred by some nervous impulse, is able to produce a change in these granules, so that they are discharged to form the secretion. How does the protoplasm work upon these granules? Does it discharge something into the fluid of its meshes, which something acts upon the granules? or does it work upon the granule through the film of fluid surrounding the granule, by something which is a sort of "action at a distance"? The action, then, in this case is very comparable to the action of the micro-organisms in question. It is for the chemists to throw light on the exact nature of the changes produced, and, when this is done, we may hope to learn how the change is brought about; but not until this is done.—Mr. Thistelton Dyer said that from the botanist's point of view he was struck with the universality of fermentative changes. Though they were so predominant a feature in the life of the lower plants, this was only an extreme manifestation of what, perhaps, all plants were capable of, if the conditions demanded it. Thus Pasteur, following up an experiment of Bérard's, found that a rhubarb leaf in an atmosphere of carbon dioxide yielded, after 48 hours, though apparently unchanged, small quantities of alcohol. The breaking up of molecules of large thermic equivalent into those of less, supplies the energy needed for the continued life of the tissues, and is the *raison d'être* of the process. But plants also set up fermentative changes external to themselves, as it were incidentally and without any obvious benefit. The investigation of Beyerinck on the production of gum by plants yielded most remarkable results. It is due to a disease which is highly contagious, and which is caused by a fungus (*Coryneum*). This produces a ferment which changes the cell-walls into gum. But what is most remarkable is that even after the disappearance of the fungus which initiated the changes, the the cells of the host plant take on a morbid habit of growth, and themselves continue the production of the ferment and therefore of gum to their own hurt. The problem is here of the most complicated kind. The series is ended by cases such as that of *Withania coagulans* (and many others are now known), where plants throw off, as bye-products of their metabolism, ferments as effective as rennet, without deriving any perceptible advantage from their possession. That plants use in working up their reserve-proteïd proteolytic ferments just as animals do, cannot be doubted. But even these they occasionally, as in the Papaw, produce in utter disproportion to their own possible requirements. Mr. Warrington said with regard to the difference between animals and plants, he thought the fact had been somewhat overlooked that plants are able to obtain their nitrogen from such simple compounds as ammonia and nitrates, whereas animals appear to require to have the nitrogen presented to them in an albumenoïd form. As to the nature of the nitrifying organism, Müntz and Schlösing claim to have isolated it and have described it. A friend who had microscopically examined his purest cultivations at Rothamsted, had been unable to find bacilli, but they appeared to contain a micrococcus. [Prof. Lankester, interposing, remarked that the growth sent to him by Mr. Warrington consisted of bacilli, and nothing else.] In explanation, Mr. Warrington said that in one of his earlier papers he had mentioned that white films appeared on some of his solutions. Prof. Lankester had examined these, but he had since found that the bacilli of which they consisted were incapable of nitrifying ammonia. Latterly he had followed Dr. Klein's method, and had introduced the infecting matter into the sterilised cultivation liquid by means of a capillary pipette, which was pushed through the cotton-wool plug closing the tube or flask; since he had done this, the films referred to had never been formed. Dr. Thudichum agreed that the ammonic changed was produced in urea by a micrococcus. The study of microphytes and of the chemical changes produced by them in the human body and in the bodies of animals was of the greatest importance. He questioned whether their action was always so specific, however, as was commonly supposed. He would also call attention to the fact that one micro-organism will kill another: thus, after plastering wine, in consequence of the removal of the tartrate, the microphyte which produces ropiness is crowded out by alcoholic forms. Dr. Stevenson calleda ttention to the importance of obtaining more information as to the alkaloidal bodies formed by the action of micro-organisms. Prof. Frankland replied that he did not mean absolutely to say that in his experiments the work was done by the *Bacillus ureæ*, but the diagram was a faithful representation of what he saw; he attributed the action to the particular organism, because it commenced when the organism appeared, and ceased when the bacilli became motionless. The necessity of studying the actions of pathogenic organisms had been prominently brought forward in the discussion. He thought there was a substantial difference between the class of chemical changes effected by plants on the one hand and by animals on the other; animals more particularly consumed as food those compounds in which much energy was stored up.

Geological Society, February 11.—Prof. T. G. Bonney, F.R.S., President, in the chair.—Arthur William Clayden, Samuel Rideal, and H. W. Williams were elected Fellows of the Society.—The following communications were read:—The Tertiary and older peridotites of Scotland, by John W. Judd, F.R.S., Sec.G.S. The very interesting rocks known as "peridotites" have been regarded by many petrographers as peculiar to, and, indeed, characteristic of, the older geological periods; but in the Western Isles of Scotland there occur a number of rocks of this class, constituting portions of intrusive masses, which the author, in a previous paper, has shown to be the central cores of Tertiary volcanoes of vast dimensions. These Tertiary peridotites are most intimately associated with the gabbros and dolerites, the felspathic and non-felspathic rocks passing into one another by insensible gradations, and the rocks of either class being intersected by veins of the other. The peridotites exhibit the same varieties of microscopic structure as the associated gabbros and dolerites, these structures being described under the names of "granitic," "ophitic," and "porphyro-granulitic." The felspars, which are rare in the peridotites, are intermediate in composition between labradorite and anorthite; they rarely, however, exhibit evidence under the microscope of being built up of laminæ belonging to different species. The study of the lamellar twinning, which is a common, but by no means universal, character in these felspar crystals, points to the conclusion that it has been induced by pressure or strain, like the similar structure in rock-forming calcite. The pyroxenes are represented by many varieties, both of the monoclinic forms (augites) and the rhombic forms (enstatites), the former being by far the most abundant. The olivines below are, for the most part, highly ferruginous varieties. The spinellids, magnetite, chromite, and picotite occur in these rocks, as do also titano-ferrite and its alteration-products. Among the accessory constituents biotite is the most abundant. It was shown that each of the minerals of these rocks is found to undergo remarkable changes as we pass from the superficial to the central portions of these intrusive rock-masses. The most important of these changes is that for which the author proposed the name "schillerization." It consists in the development of microscopic inclosures, in the form of plates and rods, along certain planes within the crystal, giving rise to metallic reflections or a play of colour. The felspars, pyroxenes, and olivines are all found to be affected in this way when they have formed the deepest parts of these volcanic cones. In this way common augite is seen at gradually increasing depths, passing into the deep-brown variety known as pseudo-hypersthene. The last-mentioned substance presents a curious mimicry of true hypersthene and paulite, which is the schillerized form of a ferriferous enstatite. The Tertiary peridotites present many variations, not only in their structure, but also in their mineralogical constitution. Among them occur examples of the rocks which have received the names of dunite, picrite, and lherzolite, with some curious types composed of felspar and olivine. Among the older peridotites of Scotland a new and very interesting type is described from near Loch Scye in Caithness. It appears to have been originally a mica-picrite, but the whole of the original minerals have been converted into paramorphs, firstly by schillerization, and subsequently by amphibolization and serpentinization. In conclusion, it was pointed out that the discrimination between the effects of the changes described as schillerization, and those known as uralitization, amphibolisation, serpentinization, and kaolinization is of the utmost importance, not only to the petrographer, but to the mineralogist.—Boulders wedged in the Falls of the Cynfael, Ffestiniog, by T. Mellard Reade, F.G.S.

Royal Microscopical Society, February 11.—Anniversary Meeting.—The President (Rev. Dr. Dallinger, F.R.S.) in the chair.—The Report of the Council showed a remarkable development of the Society during the last six years, 301 new Fellows being elected as against 97 in the preceding six years. The income showed also an important increase.—Dr. Carpenter, in moving the adoption of the Report, referred also to the success which had attended the Society's *Journal*.—Dr. Dallinger then gave his annual address to what was probably the largest gathering of Fellows ever assembled on a similar occasion. After briefly referring to the increased interest lately manifested in the study of minute organisms and recalling the characteristics of the doctrines of abiogenesis and biogenesis, he passed rapidly in review the results of the observations of Tyndall, Huxley, and Pasteur as bearing upon these questions, and called attention to the observations of Buchner as to the transformation of *Bacillus anthracis* and *Bacillus subtilis*, and *vice versâ*, and referred with approval to Dr. Klein's criticisms thereon. Having spoken of the desirability of careful and continuous study of this class of organisms, and the importance of endeavouring to establish the relation of the pathogenic form to the whole group, he said he should be better able to deal with the subject by recording a few ascertained facts rather than by making a more extended review, and he therefore devoted the main part of his address to a description of "the life-history of a septic organism hitherto unknown to science." In his observations of this form—extending over four years—he had the advantage of the highest quality of homogeneous lenses obtainable, ranging from one-tenth to one-fiftieth of an inch, his chief reliance being placed upon a very perfect one-thirty-fifth of an inch; and from the continuous nature of the observations, as well as the circumstances under which they were carried on, dry lenses had for the most part to be employed. Having in his possession a maceration of cod-fish in a fluid obtained from boiled rabbits, he found at the bottom of it, when in an almost exhausted condition, a precipitate forming a slightly viscid mass, to which his attention was particularly directed. It was seen to contain a vast number of *Bacterium termo*, but on examination with a one-tenth inch objective showed that it also contained a comparatively small number of intensely active organisms—one being discovered in about eight or ten drops of the sediment. These measured 1-10,000th of an inch in length by 1-19,500th of an inch in breadth. The fluid had originally been kept at a temperature of 90° to 95° F., and it was noticed that, when placed upon a cold stage under the microscope, the movements of the organisms became gradually slower, until at last they entirely ceased; the necessity, therefore, arose for the use of a warm stage, and the very ingenious contrivance, by which a continuous and even temperature was maintained within the one-tenth of a degree, was exhibited. The greatest difficulty in the matter was, however, experienced in obtaining specimens for observation, in order to be able to trace them from their earliest to their latest stage.—The President then explained, by means of an admirable series of illustrations projected upon a screen by the oxyhydrogen lantern, the life-history of the organism to which he had referred, exhibiting it first as a translucent, elliptic, spindle-shaped body, with six long and delicate flagella, the various positions in which the five specimens were drawn giving a very good idea of its peculiar porpoise-like movements. The various positions which it assumed in making an attack upon a portion of decomposed matter were also shown, the movements quite fascinating the observer by their rhythmical character. The supposed action of the flagella in the production of the movements observed was explained, distinct evidence being afforded of a remarkable spiral motion, at least of those behind. The process of fission was illustrated in all its observed stages from the first appearance of a constriction to that of final and complete separation, the whole being performed within the space of eight or nine minutes. A description of the process of fusion from the simple contact of two organisms to their entire absorption into each other followed, as well as their transformation into a granular mass which gradually decreased in size in consequence of the dropping of a train of granules in its wake as it moved across the field. The development of these granules was traced from their minute semi-opaque and spherical form to that of the perfect flagellate organism first shown, the entire process being completed in about an hour. Experiments as to their thermal death-point showed that, whilst the adults could not be killed by a temperature less than 146° F., the highest point endured by the germs was 190° F. Illustrations of a variety of other modes of fission discovered in previous researches on similar forms were given, showing the mode of multiple division and a similar process in the case of an organism contained in an investing envelope. The President concluded his address, which was listened to throughout with the greatest attention, by remarking that, though the processes could be seen and their progress traced, the *modus operandi* was not traceable. Yet the observer could not fail to be impressed with the perfect concurrent adaptation of these organisms to the circumstances of their being; they were subject to no caprices, their life-cycles were as perfect as those of a crustacean or a bird, and, whilst the action of the various processes was certain, their rapidity of increase and the shortness of their life-history were such that they afforded a splendid opportunity of testing the correctness of the Darwinian law.—Dr. Carpenter complimented the President on the value and interest of his address, and moved a vote of thanks, which was seconded by Mr. Crisp, who referred to the sacrifices the President had had to make in the performance of his duties during the past year. The new Council were elected.

Anthropological Institute, February 24.—Francis Galton, F.R.S., President, in the chair.—A paper on the race-types of the Jews, by Dr. A. Neubauer, was read. The opinion that the Jewish race have kept their blood unmixed is based chiefly on the fact that a Jew is almost at once recognised amongst thousands of others. From the earliest times, however, we find evidence of intermixture. Abraham's son, Ishmael, was the offspring of an Arabian woman; Joseph married an Egyptian, and Moses a Midianite. David descends from Ruth, the Moabitess, Solomon is the son of a Hittite woman, and he himself had foreign wives. We are often reminded in the Bible of the non-Jewish women who came in contact with the Israelites, and undoubtedly the "proselytes" increased the mixture of races by marrying Jewish women. At Rome the conversions were numerous, and, of course, the converts frequently married Jews. Evidence was also adduced of intermarriages in later times between Jews and Christians of various races. The differences between the Spanish-Portuguese Jews and the German-Polish Jews were so marked that in the middle ages they were believed by the Jews themselves to have descended from different tribes—Judah and Benjamin respectively. But the Italian Jews, both in features and habits, stand between the rough German and the polished Spanish Jews, and there is no evidence of any systematic emigration of the various tribes. The pronunciation of Hebrew words also varies, and this variation is believed by Dr. Neubauer to be due to the influence of the language spoken by the surrounding peoples. The difficulties of obtaining accurate measurements of Jews are very great, and but few skulls have been examined; all evidence, however, goes to disprove the existence of any pure Jewish type, uninfluenced by contact with the nations amongst which they dwell.—Mr. Joseph Jacobs read a paper on the racial characteristics of modern Jews. After enumerating the various classes of Jews now existing, the inquiry was limited to the biostatics and anthropometry of the Ashkenasim Jews, who form more than nine-tenths of the whole number. Their superior fecundity and vitality were found to be due to social causes, and were therefore only secondarily racial; an indication of racial influences was found, however, in the fact that mixed marriages between Jews and Christians are infertile. Jews enjoy no immunity from any special diseases, but they are more often colour-blind, blind, deaf, and insane than others, owing, perhaps, to their life in cities and to their frequent intermarriages. Jews were then shown to be the shortest of all Europeans except the Magyars, and to have the narrowest chest. Their skulls are mostly brachycephalic. An examination of over 100,000 Jews showed that they have darker hair and eyes than those of any nation in Northern Europe, though nearly one-fifth of the Jews have blue eyes, and they have nearly twice as many red-haired individuals as the inhabitants of the Continent. A number of composite photographs of Jewish boys, prepared by Mr. Galton, were exhibited to show the Jewish type, and were compared with early representations of Jews in Assyrian art. The Jewish face was said to be a combination of Semitic features and Ghetto expression. Turning to the question of the purity of the race, it was pointed out that this depended on the number of proselytes made by Jews in ancient and mediæval times. The earlier proselytes, before the foundation of Christianity, were mostly fellow-Semites, and would not affect the type, while the numbers made afterwards were too small to modify the race, owing to their infertility and the tendency of the offspring to revert to the Jewish parent. A considerable number of Jews, the Cohens, or descendants of Aaron, were not allowed to marry proselytes, and must consequently be tolerably pure. The general conclusion reached was therefore in favour of the purity of the Jewish race.

Royal Meteorological Society, February 18.—Mr. R. H. Scott, F.R.S., President, in the chair.—Messrs. H. B. Baker, M.D., S. Dixon, R. Foster, and B. O. Meek, F.L.S., were elected Fellows of the Society.—The following papers were read:—How to detect the anomalies in the annual range of temperature, by Dr. Buys Ballot. The author shows that it is most likely that only a long-continued series of observations can give some evidence of an interruption of rise and fall, especially in latitudes where the temperature of the same day in different years may differ by 20° C., as in St. Petersburg.—Cloud observing, by D. W. Barker. As there is a great deal of confusion amongst cloud-observers, not only as to the particular names of clouds, but more especially with regard to their movements, the author recommends that there should be two simple divisions, viz. "stratiform" and "cumuliform." To the stratiform belong all the higher forms of cloud and a few of the lower; to the latter belong the typical cumulus cloud always seen in the lower atmosphere. From the result of numerous observations the author's conclusion is that the actual normal action of the cirro-filum cloud is along the line of filature, and that, knowing the bearing of the V or radiating point, the direction of its motion can be at once inferred. In all cases the V point first formed in the point from which the cloud is coming, but it will frequently be noticed that threads first appear parallel to a certain point on the horizon, and in all sorts of positions between this and the central V point.—A suggestion for the improvement of radiation-thermometers, by W. F. Stanley. The author suggests that the radiation-thermometer should indicate the amount of heat radiated by the sun upon a metal ball of a certain size, this being an object easy of uniform reproduction by mechanical means. For experiment he made three hollow copper balls, which were cast with ordinary filed cores, and were of different weights. These balls were turned to exact external diameter of 1·4 inch, with similar necks of the insertion of thermometers. The surfaces were oxidised by heating to resemble the oxidation produced by the atmosphere. In each of these balls a similar thermometer was inserted, closing around the neck just sufficient to keep it steady by cotton thread soaked in paraffin. The three thermometers thus inclosed in the metal balls, when exposed to sunshine and placed at two inches above a piece of black board, appeared to register, under similar conditions, exactly alike. The experiments for three summer months gave from 6° to 11° difference between the sun and shade.

Entomological Society, February 4.—R. McLachlan, F.R.S., President, in the chair.—The President returned thanks for his election, and nominated Messrs. Dunning, Stevens, and Weir as Vice-Presidents for the coming year.—Two new members were elected.—Mr. J. W. Slater exhibited a specimen of *Polyommotus chryseis* from Aberdeenshire.—Rev. A. Fuller exhibited a collection of insects captured along the line of the Canadian Pacific Railway.—Mr. W. Cole exhibited a wasp's nest which appeared to have been inhabited by *Vespa norvegica* and *sylvestris* in common.—Mr. W. L. Distant exhibited a series of wings of Indian butterflies, received from Mr. de Nicéville, showing the differences between broods of the same insect in the wet and dry seasons respectively, which had hitherto been generally regarded as distinct species.—Mr. E. A. Butler exhibited egg-cases of three species of *Mantidæ* from Bechuanaland.—Mr. W. F. Kirby (on behalf of Herr Buchecker, of Munich, who was present as a visitor) exhibited three volumes of drawings of *Hymenoptera.*—Mr. H. T. Stainton exhibited specimens of *Chauliodus insecurellus* from Gascony.—Mr. T. R. Billups exhibited various English *Ichneumonidæ* and *Hemiptera.*—Papers read:—Mr. G. F. Mathew, on the life-history of *Papilia Schmeltzi*, *P. Godeffroyi*, and *Xois Sesara;* and Mr. G. Lewis, on a new genus of *Histeridæ* from Japan.

EDINBURGH

Royal Society, February 16.—Mr. John Murray, Vice-President, in the chair.—Mr. W. E. Hoyle read the first part of a paper on the Cephalopoda of the *Challenger* Expedition. Mr. Hoyle confined attention in this paper to the octopods. Nineteen of these are new to science.—Sir W. Thomson gave a communication on energy in vortex motion. This subject he treated under five heads:—(*a*) energy in vibrations; (*b*) unlimited augmentation of energy of a simply continuous fluid mass in a space of given shape, by changes from and back to this shape; (*c*) annulment of energy under same conditions; (*d*) reduction of energy to absolute minimum in a multiply continuous space of given shape; (*e*) unlimited augmentation of energy in a multiply continuous space.—Dr. Thomas Muir submitted the first part of an exhaustive investigation into the theory of determinants in the historical order of development.—Dr. Muir also, in a paper on bipartite functions, developed a new notation for the expression of quantics, and proceeded to exemplify its use by applying it to the simplification of the proof of Galois's theorem regarding the continued fraction representation of the roots of an equation.—A letter from Prof. Michie Smith was read. He observed the zodiacal light from the top of Dodabettah. No bright lines were seen, and the light did not appear to share in the diurnal motion of the heavens, for it was seen unaltered in position for four hours after sunset. Prof. Smith also showed that in a condensing mist the air-potential is uniformly and markedly higher than the average for the time of day, while the reverse occurs in an evaporating mist.—Prof. Tait gave experimental proof of Sir W. Thomson's theory of the equilibrium of vapour with a liquid under surface-tension by means of two atmometers, in one of which artificial condensation was produced, while under the atmospheric conditions at the time evaporation would be going on in both.—Mr. John Aitken exhibited a new apparatus for the combination of colours.

PARIS

Academy of Sciences, February 21.—M. Rolland in the chair.—Annual elocution, by M. Rolland, President of the Academy for 1884. The chief topics touched upon were the life and work of the late distinguished members of the Academy—M. J. B. Dumas, MM. du Moncel, Wurtz, and Thenard; the aërostatic essays of MM. Renard and Krebs, which were regarded as marking a new era in aërial navigation; M. Janssen's action in reference to the universal meridian adopted at the recent Congress of Washington; the outbreak of cholera in the south of France and in Paris; M. Pasteur's experiments with the charbon virus and rabies; the progress of electric discoveries.—Announcement of the prizes awarded for the year 1884. Amongst the successful competitors were MM. Manen and Hanusse (mechanics); M. Baills (traité de balistique rationelle); M. Riggenbach (mountain railway); M. Jules Houël (contributions to pure mathematics); M. du Rocher du Quengo (improvement in screw steam navigation); M. Radau (astronomy); M. Ginzel (lunar physics); M. G. Cabanellas (theory of applied electricity); M. Alfred Durand-Claye (statistics); M. Chancel (organic chemistry); M. Emile Rivière (geology); M. Otto Lindberg (botany); M. P. Fischer (zoology); M. Testut (medicine and surgery); Dr. Cadet de Gassicourt (diseases of infants); M. Tourneux (embryology); MM. Cadiat and Kowalevsky (anatomy); MM. Jolyet and Laffont (experimental physiology); Capt. H. Berthaut (physical geography); M. Marsant (improved safety lamp for miners); M. de Tastes (meteorology); Dr. Neis (geographical exploration); M. J. Boussingault (applied chemistry).—Programme of the prizes prepared for the years 1885, 1886, 1887, and 1893. Amongst these is the sum of 100,000 francs left by M. Bréant in 1849, and still unawarded, "to whoever shall find an efficacious remedy for Asiatic cholera, or shall discover the causes of this terrible scourge." To secure this valuable prize it will be necessary (1) to find a means of curing Asiatic cholera in the immense majority of cases; (2) or to indicate with absolute certainty the causes of Asiatic cholera, so that by their suppression the epidemic shall cease; (3) or to discover a certain prophylactic as infallible, for instance, as is vaccination for small-pox.

STOCKHOLM

Royal Academy of Sciences, February 11.—The following memoirs were presented for insertion in the *Transactions* of the Academy.—Contributions to the knowledge of the Spongiæ of Bohuslan, by Herr C. Fristedt.—On a Silurian scorpion from Gotland, by Profs. Tamerlan Thorell and G. Lindström.—Review of the Salmonoids of the Stockholm Museum, by Prof. F. A. Smitt.—On the structure of the organs of circulation and digestion in the Annilides of the families of the Amphoretidæ, Terebellidæ, and Amphictenidæ, by Herr A. Wirén.—Prof. Edlund communicated the results of his latest researches on the nature of the electric discharges in air of unequal density.—Prof. Rubenson spoke in his paper on the passage of the light through isotropic substances.—Prof. Nordenskjöld presented for the *Proceedings*—(1) Catalogue of the meteorites in the Mineralogical Museum of the University of Upsala, by Dr. G. Holm; (2) researches on varieties of Diopside from Nordmarken, by Herr G. Flink; (3) hydrographic and chemical observations during the Swedish expedition to Greenland in 1883, by Herr Axel Hamberg.—Prof. Warming reported on comparative researches on the anatomy of the stems and the subterranean stolons, by Herr Fritz Haupt.—The Secretary of the Academy, Prof. Lindhagen, presented: on the minerals of the didymium group, by Dr. M. Weibull. On mononitro-a-naftalacid, by Dr. A. G. Ekstrand. On the chlorophyllophyceæ of Siberia, by Dr. R. Boldt.

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